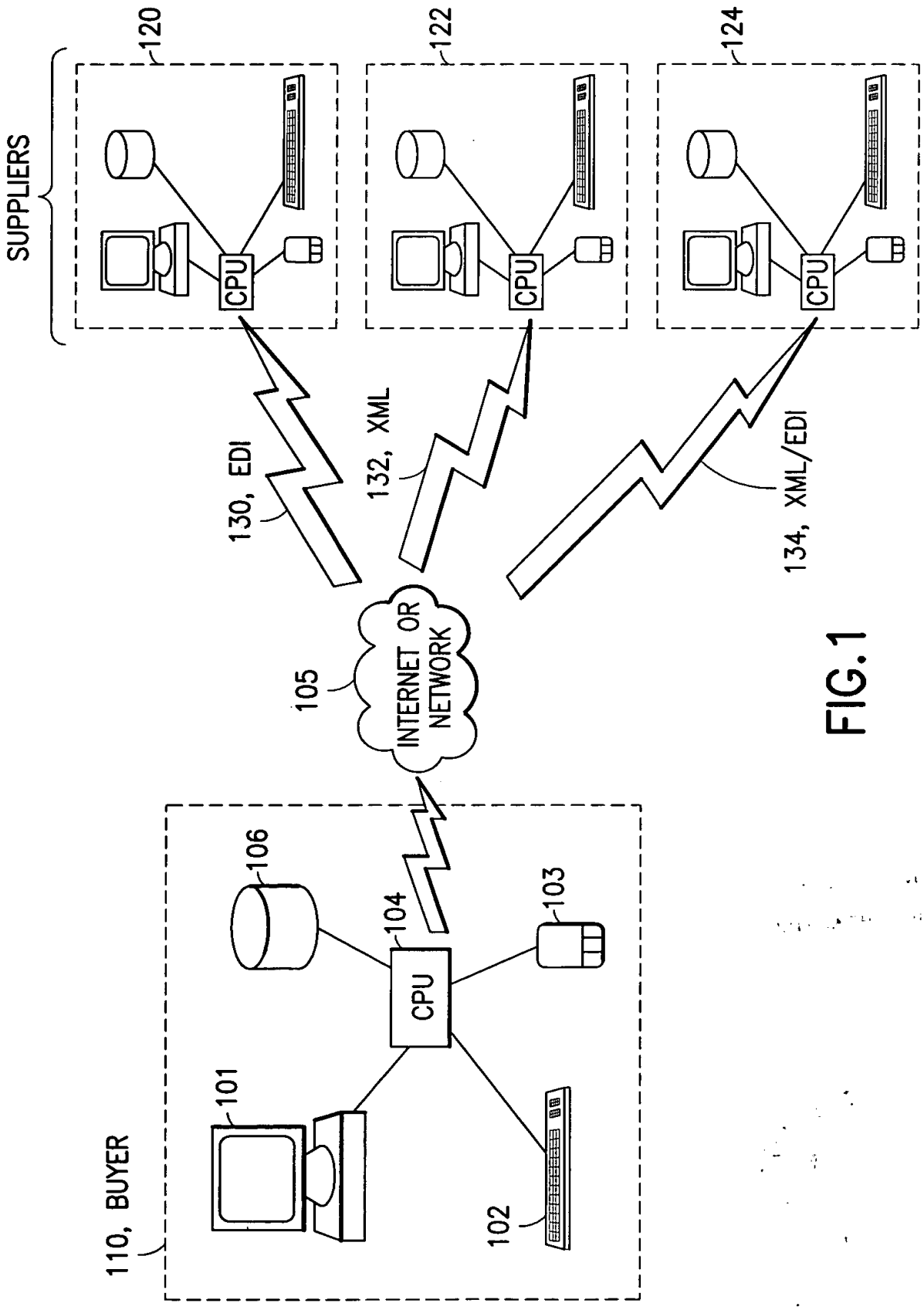

SUPPLIERS
120
122
124
CPU
CPU
CPU
130, EDI
132, XML
134, XML/EDI
105
INTERNET OR NETWORK
110, BUYER
101
102
103
104
106
CPU

FIG. 1

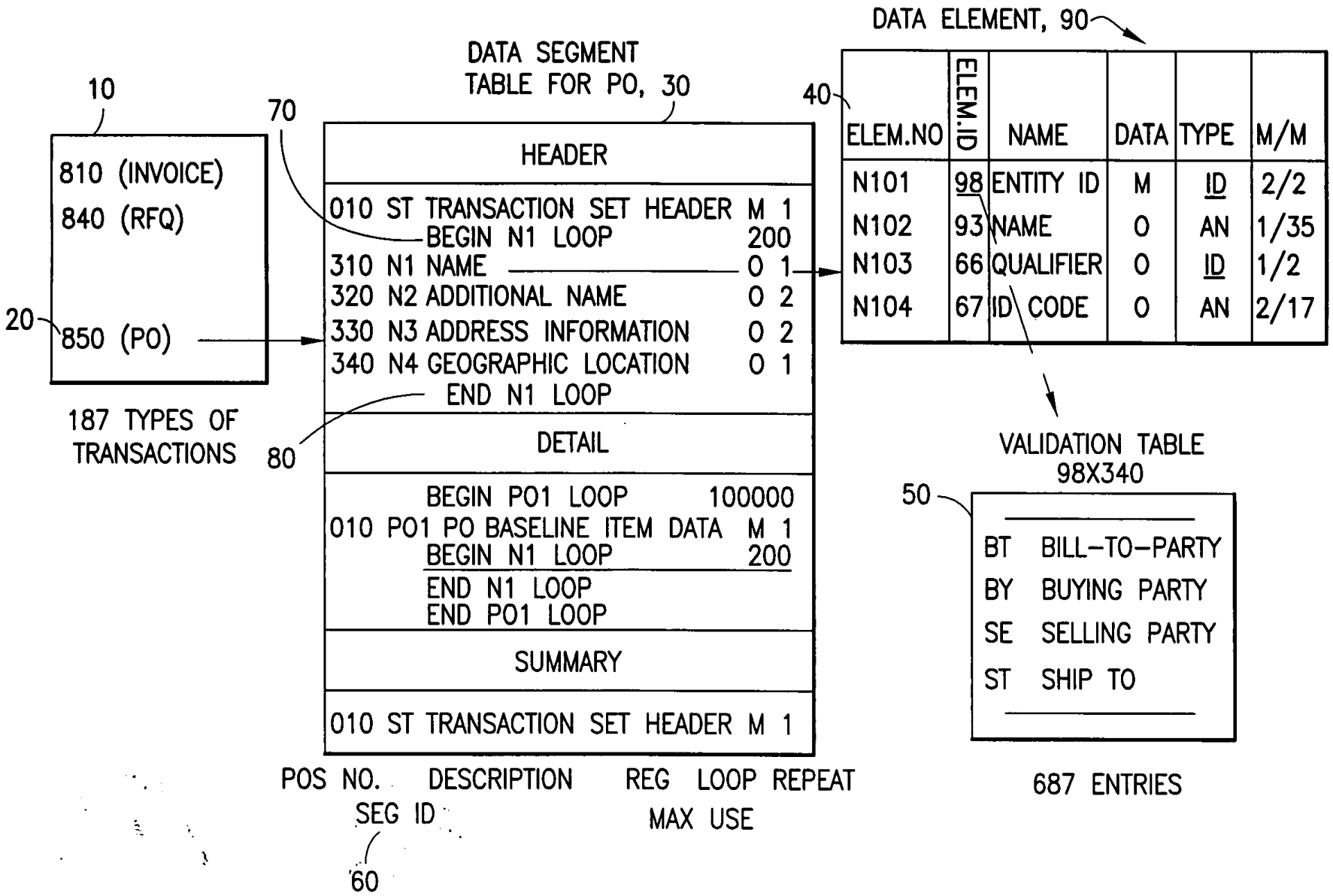

10
810 (INVOICE)
840 (RFQ)
20
850 (PO)
187 TYPES OF TRANSACTIONS
70
80
DATA SEGMENT TABLE FOR PO, 30
HEADER
010 ST TRANSACTION SET HEADER M 1
BEGIN N1 LOOP 200
310 N1 NAME O 1
320 N2 ADDITIONAL NAME O 2
330 N3 ADDRESS INFORMATION O 2
340 N4 GEOGRAPHIC LOCATION O 1
END N1 LOOP
DETAIL
BEGIN PO1 LOOP 100000
010 PO1 PO BASELINE ITEM DATA M 1
BEGIN N1 LOOP 200
END N1 LOOP
END PO1 LOOP
SUMMARY
010 ST TRANSACTION SET HEADER M 1
POS NO. DESCRIPTION REG LOOP REPEAT
SEG ID MAX USE
60
DATA ELEMENT, 90
40
ELEM.NO
ELEM.ID
NAME
DATA
TYPE
M/M
N101 98 ENTITY ID M ID 2/2
N102 93 NAME O AN 1/35
N103 66 QUALIFIER O ID 1/2
N104 67 ID CODE O AN 2/17
VALIDATION TABLE 98X340
50
BT BILL-TO-PARTY
BY BUYING PARTY
SE SELLING PARTY
ST SHIP TO
687 ENTRIES

FIG.2A

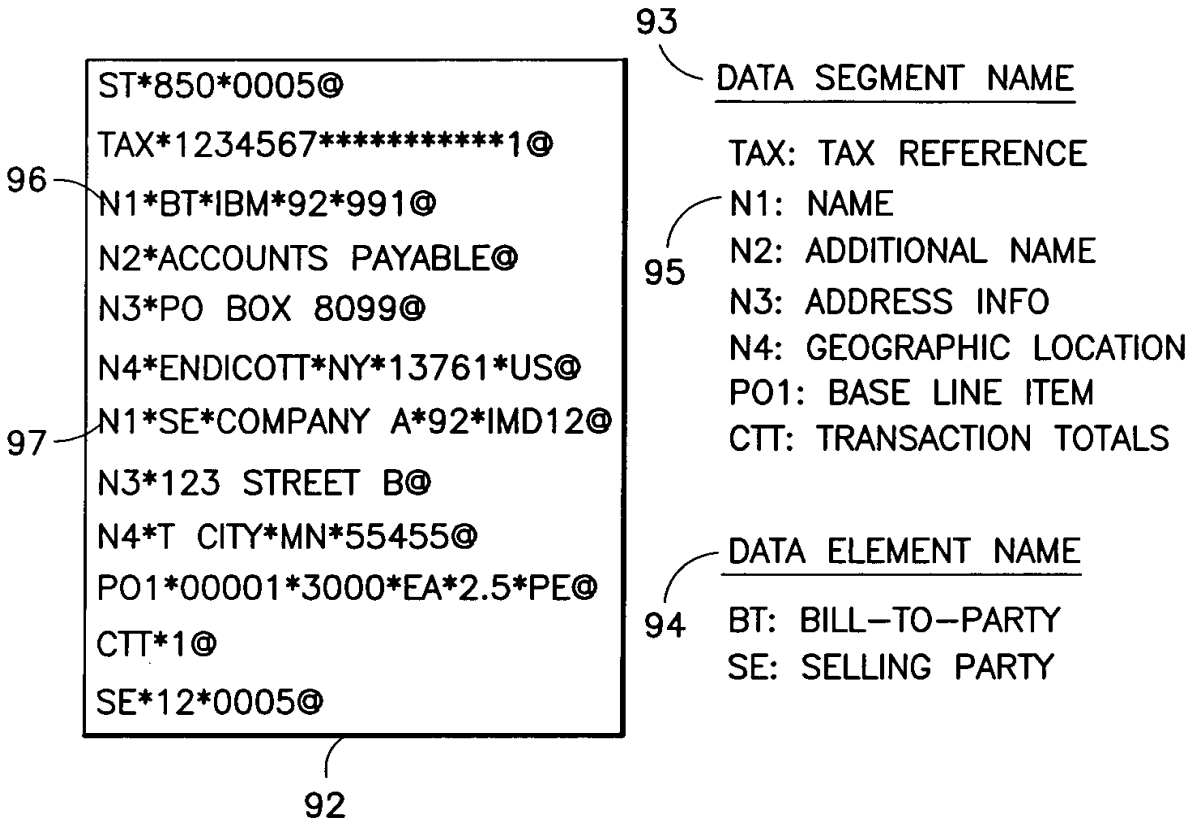

93
DATA SEGMENT NAME
ST*850*0005@
TAX*1234567**********1@
96
N1*BT*IBM*92*991@
N2*ACCOUNTS PAYABLE@
N3*PO BOX 8099@
N4*ENDICOTT*NY*13761*US@
97
N1*SE*COMPANY A*92*IMD12@
N3*123 STREET B@
N4*T CITY*MN*55455@
PO1*00001*3000*EA*2.5*PE@
CTT*1@
SE*12*0005@
92
TAX: TAX REFERENCE
N1: NAME
N2: ADDITIONAL NAME
95
N3: ADDRESS INFO
N4: GEOGRAPHIC LOCATION
PO1: BASE LINE ITEM
CTT: TRANSACTION TOTALS
DATA ELEMENT NAME
94
BT: BILL-TO-PARTY
SE: SELLING PARTY

FIG.2B

```
<!DOCTYPE transactionSet [
                    200
                   /
<!ELEMENT transactionSet (name, (loopIsegment)*)>
<!ATTLIST transactionSet
        code CDATA #REQUIRED
        version CDATA #REQUIRED
        standard (X12 | EDIFACT) "X12"
>
                    210
                   /
<!ELEMENT loop ((loop | segment)*)>
<!ATTLIST loop
        code CDATA #REQUIRED
>
                    220
                   /
<!ELEMENT segment (name, element*)>
<!ATTLIST segment
        code CDATA #REQUIRED
>
                    230
                   /
<!ELEMENT element (name, value)>
<!ATTLIST element
        code CDATA #REQUIRED
>
                    240
                   /
<!ELEMENT name (#PCDATA)>

                    250
                   /
<!ELEMENT value (#PCDATA)>
<!ATTLIST value
        code CDATA #REQUIRED
>
]>
```

FIG.2C

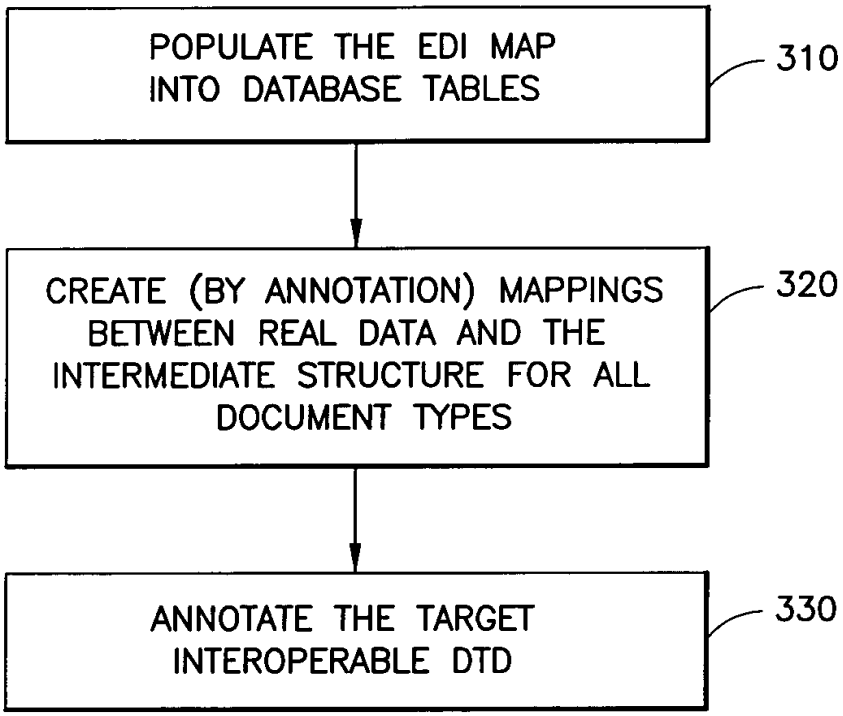

POPULATE THE EDI MAP INTO DATABASE TABLES
310
CREATE (BY ANNOTATION) MAPPINGS BETWEEN REAL DATA AND THE INTERMEDIATE STRUCTURE FOR ALL DOCUMENT TYPES
320
ANNOTATE THE TARGET INTEROPERABLE DTD
330

FIG.3

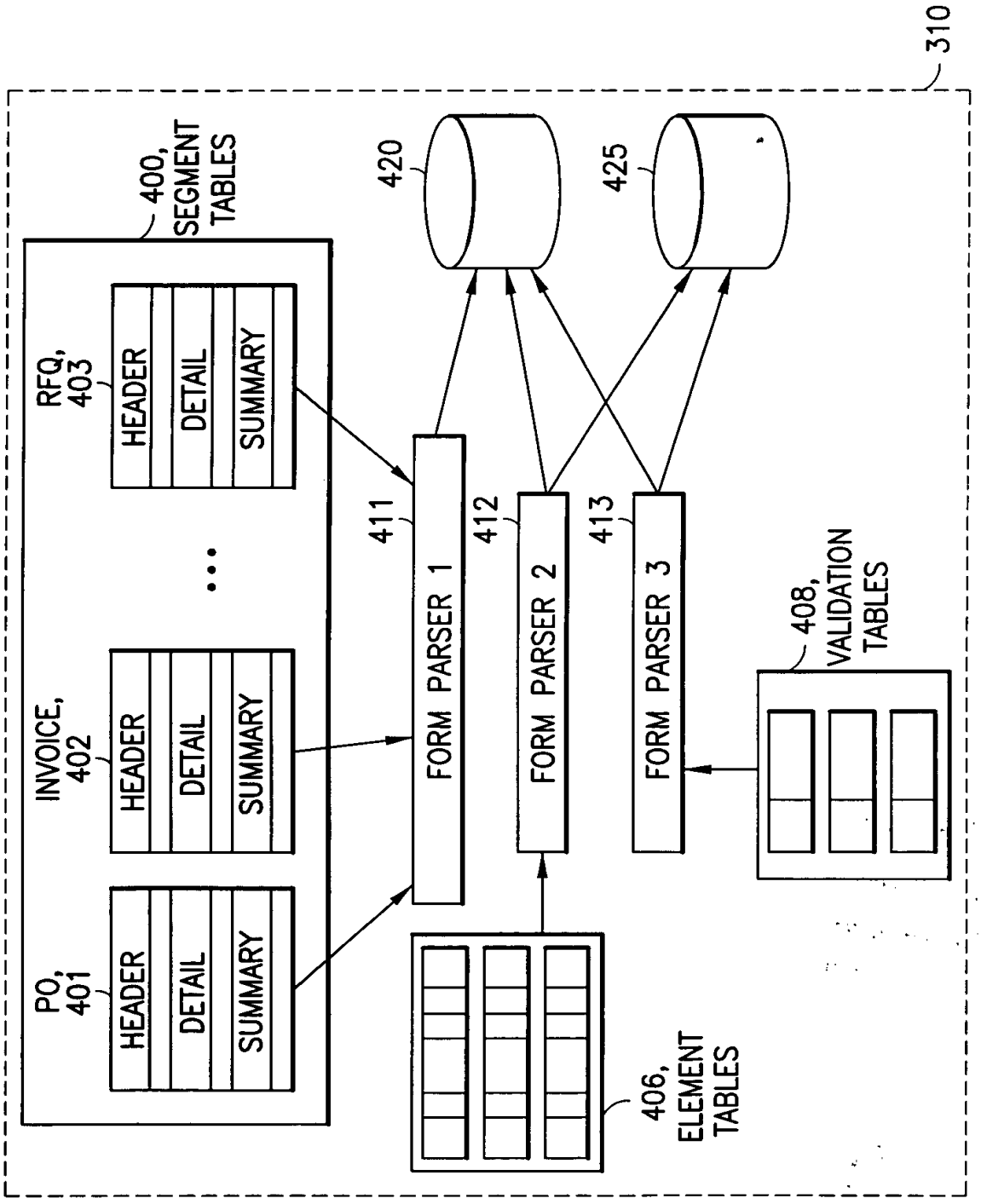

310
400, SEGMENT TABLES
PO, 401
INVOICE, 402
RFQ, 403
HEADER
DETAIL
SUMMARY
420
425
411
412
413
FORM PARSER 1
FORM PARSER 2
FORM PARSER 3
408, VALIDATION TABLES
406, ELEMENT TABLES

FIG. 4A

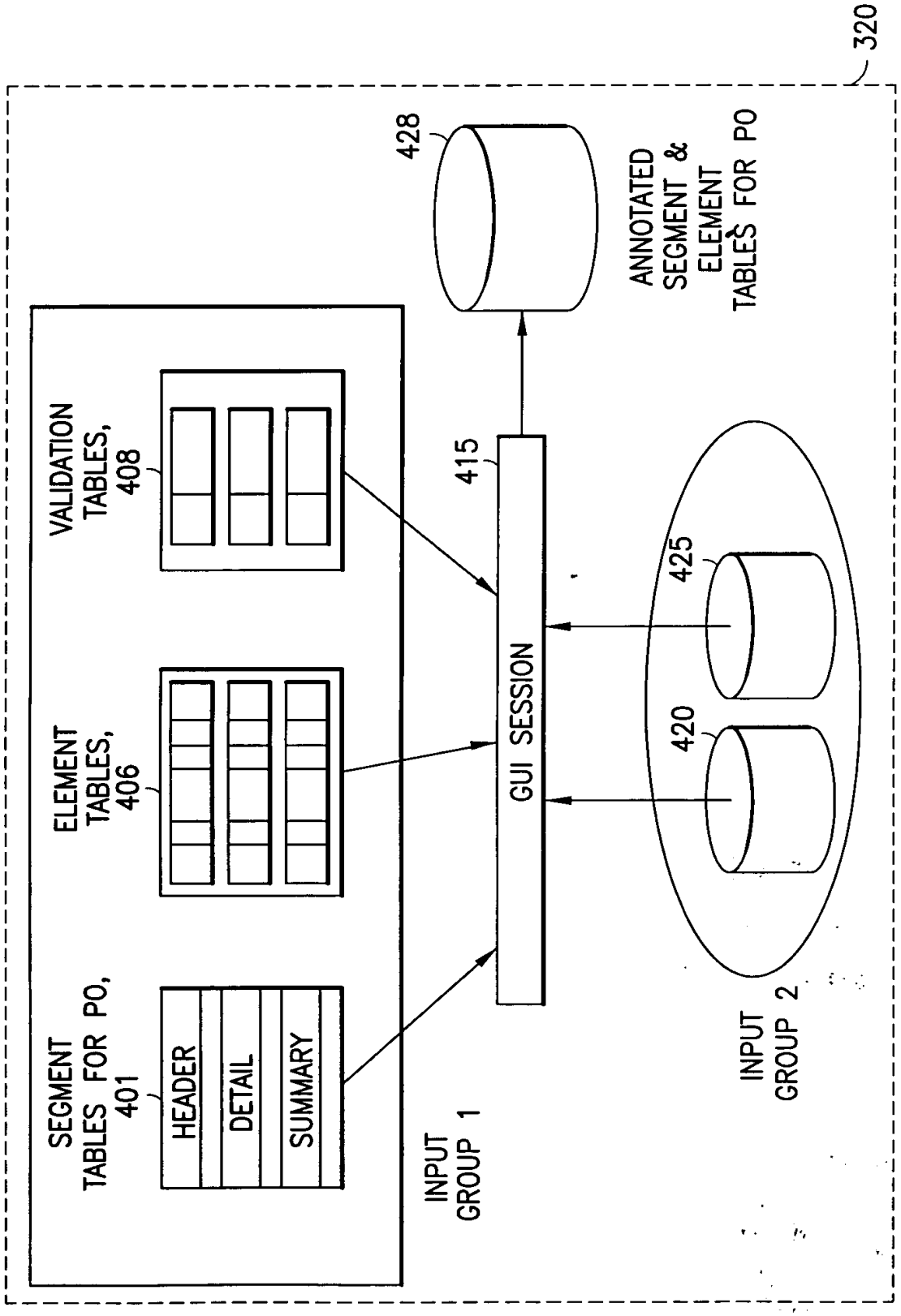

320
428
ANNOTATED SEGMENT & ELEMENT TABLES FOR PO
VALIDATION TABLES, 408
415
ELEMENT TABLES, 406
GUI SESSION
425
420
SEGMENT TABLES FOR PO, 401
HEADER
DETAIL
SUMMARY
INPUT GROUP 1
INPUT GROUP 2

FIG.4B

```
<!DOCTYPE transactionSet [
                    450                                    460
<!ELEMENT transactionSet (name:: w:=<getDocumentType(in1)>,
                loop::p:=<x.code>|segment::p:=<x.code>) :x.choice*
                ::x:=SQL("SELECT" FROM EDI WHERE map='$in1'
                ORDER BY pos"))>::dummy:=<initValue(in0)>
                                                                456
                                                                458
<!ATTLIST transactionSet
        code CDATA #REQUIRED: getDocumentNumber(in1)
        version CDATA #REQUIRED:"004010"                        459
        standard (X12 | EDIFACT) "X12"
>               451                 457
<!ELEMENT loop ((loop::p:=<concat(p,"@", x.code)> |
                segment::p:=<concat(p,"@", x.code)>): x.choice*
                ::x:=SQL("SELECT" FROM EDI WHERE map='$x.code'
                ORDER BY pos"))>
<!ATTLIST loop
        code CDATA #REQUIRED: x.name
>               452
<!ELEMENT segment (name::w:=<x.name>,
        element*::y:=row(EDI, <map>, <x.code>))>
<!ATTLIST segment
        code CDATA #REQUIRED: x.code
>               453
<!ELEMENT element (name::w.=<y.name>, value)>
<!ATTLIST element
        code CDATA #REQUIRED: y.code
>               454
<!ELEMENT name (#PCDATA:w)>
                455                         474
<!ELEMENT value (#PCDATA: value4Element(val, y.code, y.type)>
        ::val:=<getEDI Value(y.code, p)>
                                    470
<!ATTLIST value
        code CDATA #IMPLIED:id4Element(val, y.type)
                                            472
>
]>
```

430

FIG.4C

500 MAP	502 CODE	504 POS	506 CHOICE	508 TYPE	510 NAME
TS850	ST	0010	SEGMENT		TRANSACTION SET HEADER
TS850	BEG	0020	SEGMENT		BEGINNING SEGMENT FOR PO
TS850	REF	0050	SEGMENT		REFERENCE NUMBERS
TS850	LOOP_N1	0301	LOOP		N1
TS850	LOOP_PO1	1010	LOOP		PO1
TS850	CTT	2010	SEGMENT		TRANSACTION TOTALS
TS850	SE	2030	SEGMENT		TRANSACTION SET TRAILER
LOOP_N1	N1	0310	SEGMENT		NAME
LOOP_N1	N2	0320	SEGMENT		ADDITIONAL NAME INFORMATION
LOOP_N1	N3	0330	SEGMENT		ADDRESS INFORMATION
LOOP_N1	N4	0340	SEGMENT		GEOGRAPHIC LOCATION
LOOP_PO1	PO1	1010	SEGMENT		BASELINE ITEM DATA
LOOP_PO1	LOOP_PID	1050	LOOP		PID
LOOP_PID	PID	1050	SEGMENT		PRODUCT/ITEM DESCRIPTION
ST	143		ELEMENT	ID	TRANSACTION SET ID CODE
ST	329		ELEMENT	AN	TRANSACTION SET CONTROL NUMBER
N1	98		ELEMENT	ID	ENTITY IDENTIFIER CODE
N1	93		ELEMENT	AN	NAME
N1	66		ELEMENT	ID	ID CODE QUALIFIER
N1	67		ELEMENT	AN	ID CODE

420 515 516 517 518

FIG.5A

520 ELEMENT ID	522 CODE	524 VALUE	425
143	810		X12 INVOICE
143	850		X12 PURCHASE ORDER
530 98	BT 540		BILL-TO-PARTY 550
531 98	BY 541		BUYING PARTY 551
532 98	SE 542		SELLING PARTY 552
533 98	ST 543		SHIP TO 553
66	1		D-U-N-S NUMBER, DUN & BRADSTREET
66	8		VENDOR UPS CODE
66	9		D-U-N-S+4, D-U-N-S NUMBER WITH 4 CHARACTER SUFFIX
66	92		ASSIGNED BY BUYER OR BUYER'S AGENT

FIG.5B

FIG.6A

LEVEL (610)	SEGMENT ELEMENT/CODE (600)	REPEAT (602)	ANNOTATION (604)	DESCRIPTION (606)	LABEL (608)
1	ST		x:=row(PO, poid, in0)	TRANSACTION SET HEADER (650, 651)	ST (653)
2	ST01/143		"850" (628)	ID CODE (652)	ST@143
2	ST02/329		in0	CONTROL NUMBER	ST@329
1 (620)	LOOP N1	*	y:=row(company, coid, x.buyer)	N1/BUYER	LOOP_N1
2	N1		(621) (630)	NAME	LOOP_N1@N1
3	N101/98		"BY"	ENTITY ID	LOOP_N1@N1@98
3	N102/93		y.name	NAME	LOOP_N1@N1@93
2	N4		(629)	GEOGRAPHIC LOCATION	LOOP_N1@N4
3	N402/156		y.addr.	STATE	LOOP_N1@N4@156
1 (622)	LOOP_N1	*	y:=row(company, coid, x.seller)	N1/SELLER	LOOP_N1
2	N1		(623) (635)	NAME	LOOP_N1@N1
3	N101/98		"SE"	ENTITY ID	LOOP_N1@N1@98
3	N102/93		y.name	NAME	LOOP_N1@N1@93
2	N4			GEOGRAPHIC LOCATION	LOOP_N1@N4
3	N402/156		y.addr.	STATE	LOOP_N1@N4@156
1 (625)	LOOP_P01	*	z:=row(lineitem, poid, in0)	P01/LINE ITEM INFO	LOOP_P01
2	P01		(640)	BASE LINE ITEM	LOOP_P01@P01
3	P0101/350		z.prodid	ID	LOOP_P01@P01@350
3	P0102/330		"1" (642)	QUANTITY	LOOP_P01@P01@330

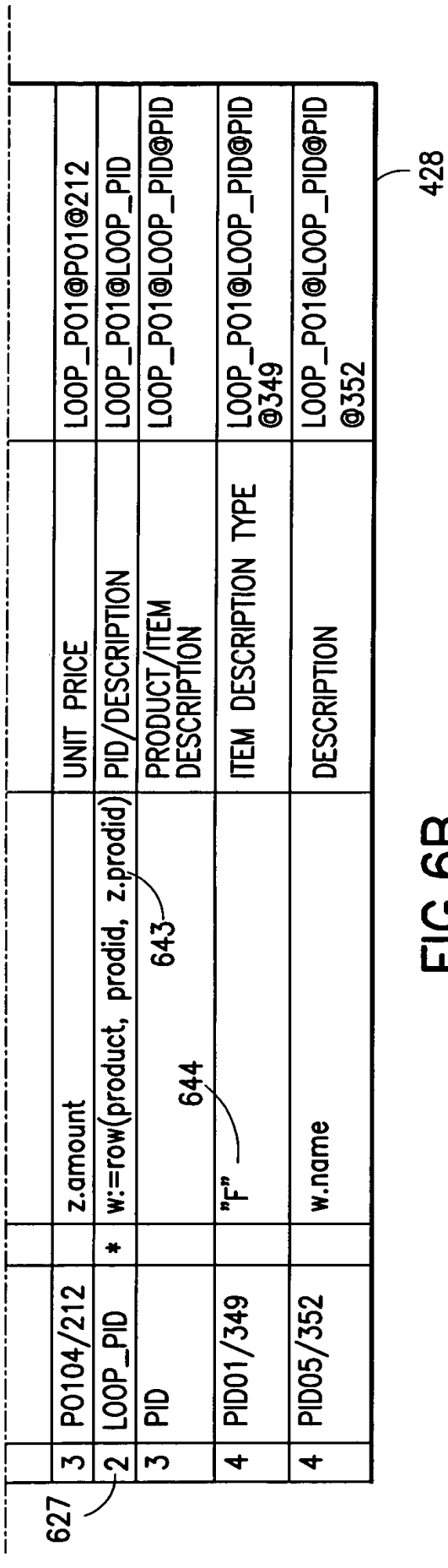


FIG.6B

FIG.6

FIG.6A
FIG.6B

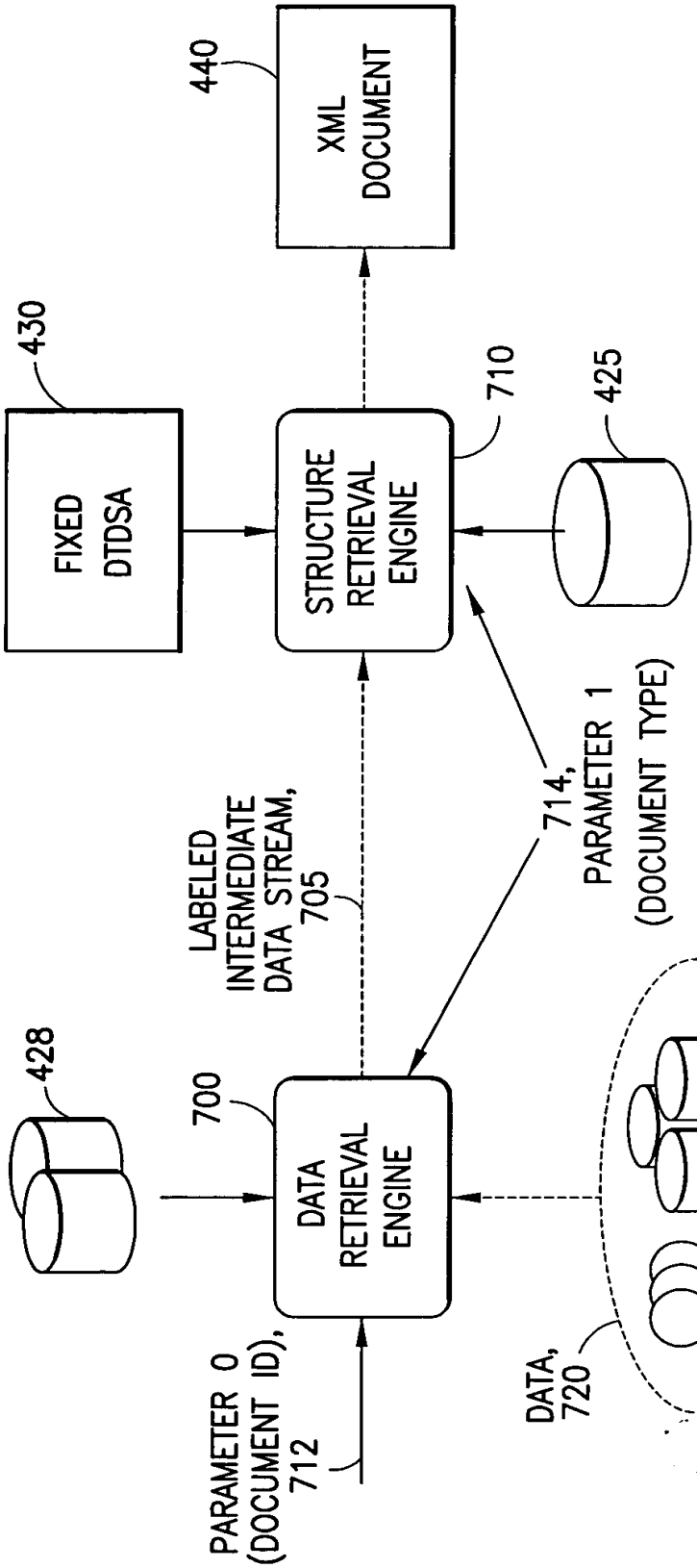

440
XML DOCUMENT
430
FIXED DTDSA
710
STRUCTURE RETRIEVAL ENGINE
425
LABELED INTERMEDIATE DATA STREAM, 705
714, PARAMETER 1 (DOCUMENT TYPE)
428
700
DATA RETRIEVAL ENGINE
DATABASE
OBJECTS
DATA, 720
PARAMETER 0 (DOCUMENT ID), 712

FIG.7A

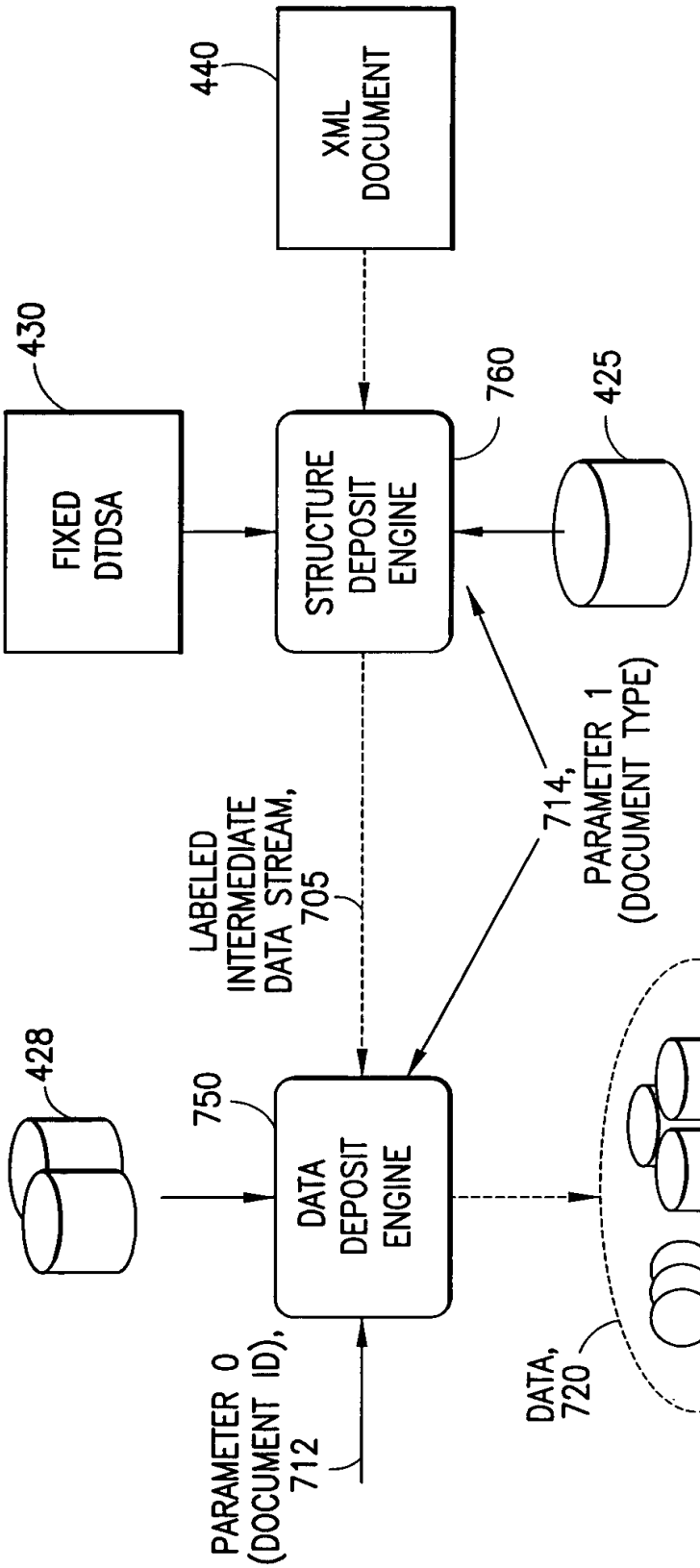

440
XML DOCUMENT
430
FIXED DTDSA
760
STRUCTURE DEPOSIT ENGINE
425
LABELED INTERMEDIATE DATA STREAM, 705
714, PARAMETER 1 (DOCUMENT TYPE)
428
750
DATA DEPOSIT ENGINE
DATABASE
OBJECTS
DATA, 720
PARAMETER 0 (DOCUMENT ID), 712

FIG.7B

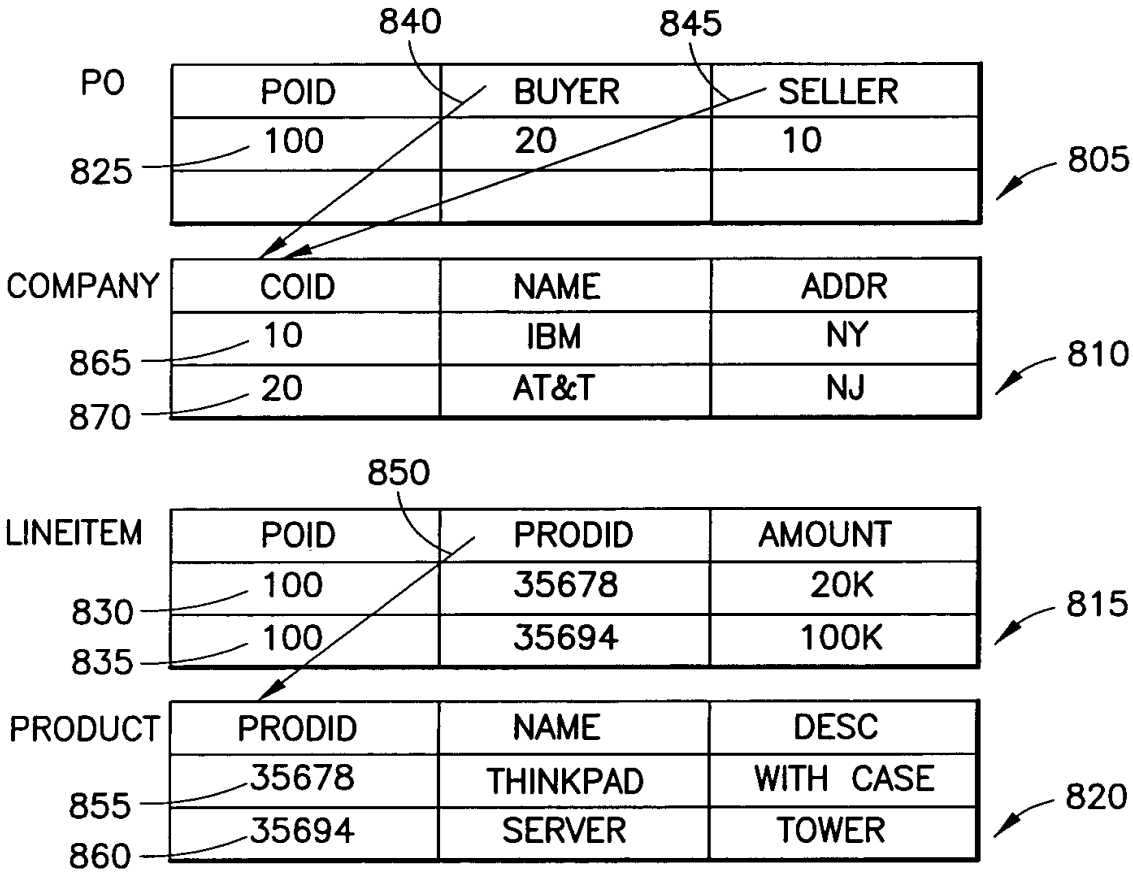

840
845
PO
POID
BUYER
SELLER
100
20
10
825
805
COMPANY
COID
NAME
ADDR
10
IBM
NY
865
20
AT&T
NJ
870
810
850
LINEITEM
POID
PRODID
AMOUNT
100
35678
20K
830
100
35694
100K
835
815
PRODUCT
PRODID
NAME
DESC
35678
THINKPAD
WITH CASE
855
35694
SERVER
TOWER
860
820

FIG.8A

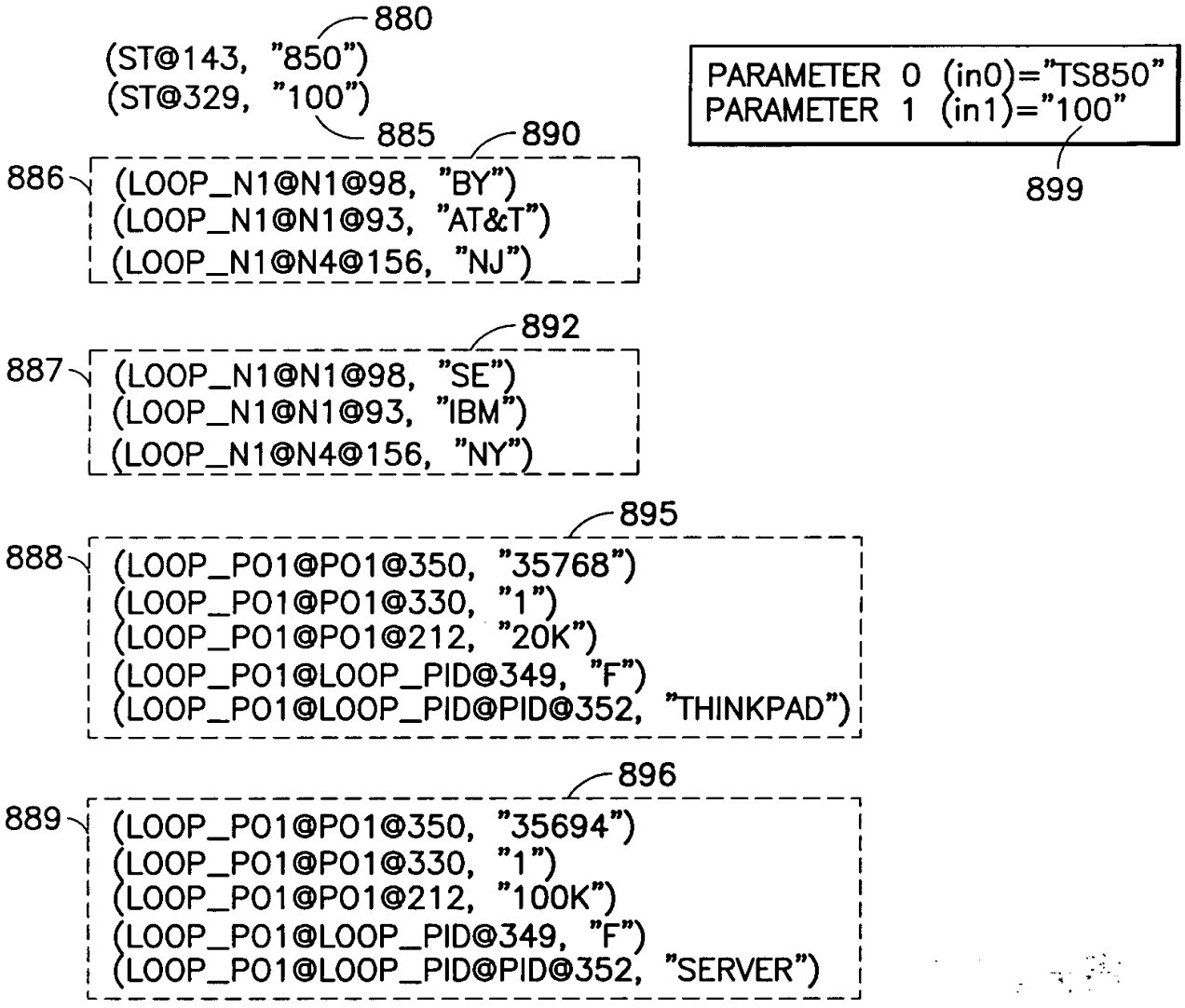

880
(ST@143, "850")
(ST@329, "100")
885
890
886
(LOOP_N1@N1@98, "BY")
(LOOP_N1@N1@93, "AT&T")
(LOOP_N1@N4@156, "NJ")
892
887
(LOOP_N1@N1@98, "SE")
(LOOP_N1@N1@93, "IBM")
(LOOP_N1@N4@156, "NY")
895
888
(LOOP_P01@P01@350, "35768")
(LOOP_P01@P01@330, "1")
(LOOP_P01@P01@212, "20K")
(LOOP_P01@LOOP_PID@349, "F")
(LOOP_P01@LOOP_PID@PID@352, "THINKPAD")
896
889
(LOOP_P01@P01@350, "35694")
(LOOP_P01@P01@330, "1")
(LOOP_P01@P01@212, "100K")
(LOOP_P01@LOOP_PID@349, "F")
(LOOP_P01@LOOP_PID@PID@352, "SERVER")
PARAMETER 0 (in0)="TS850"
PARAMETER 1 (in1)="100"
899

FIG.8B

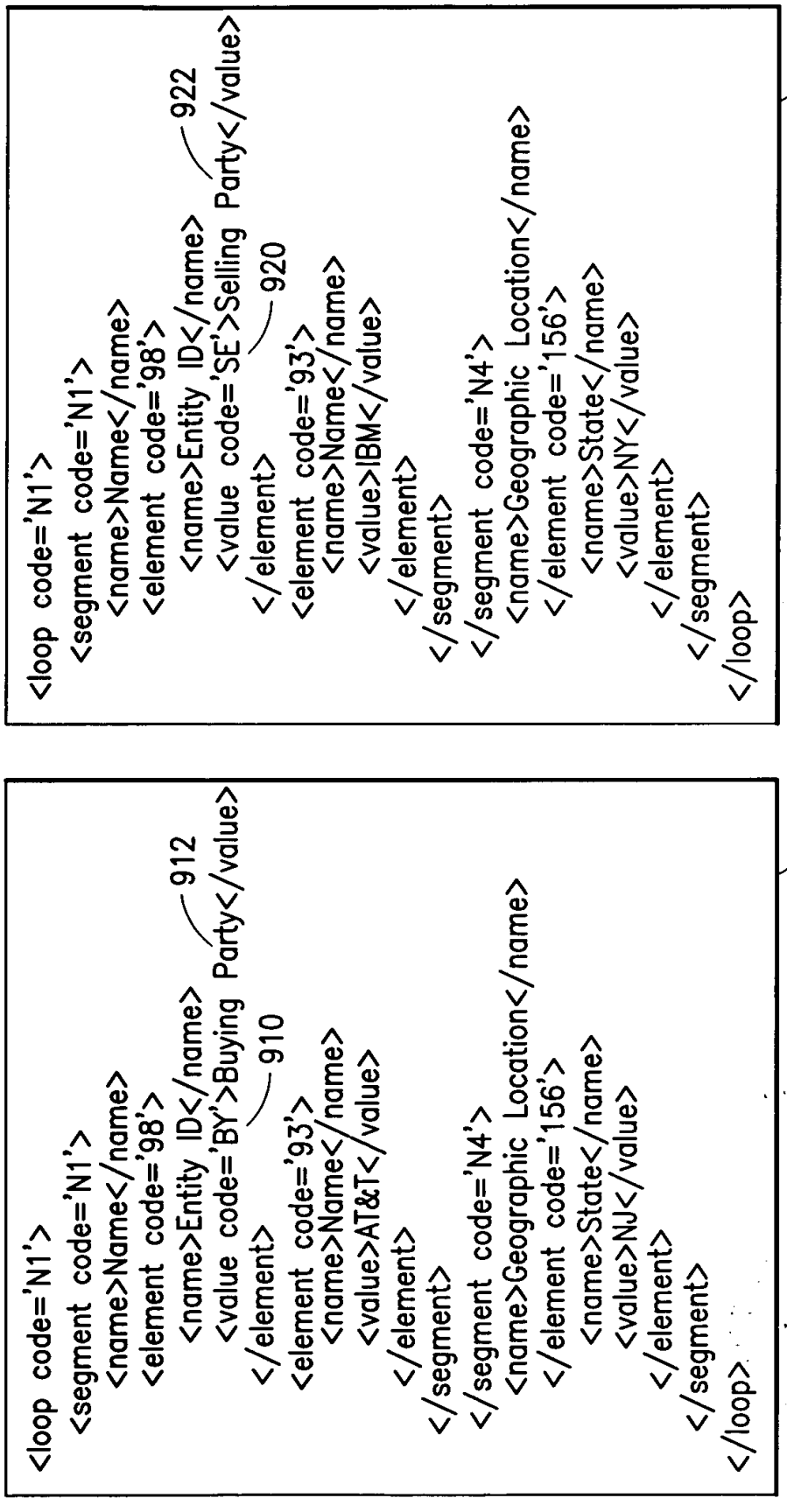
```
<transactionSet code='850' version='004010' standard='X12'>
<name>Purchase Order</name>

<segment code='ST'>
   for header ——— 800
</segment>
<loop code='N1'>
   for buyer ——— 802
</loop>
<loop code='N1'>
   for seller ——— 804
</loop>
<loop code='PO1'>
   first line item ——— 806
</loop>
<loop code='PO1'>
   second line item ——— 808
</loop>
</transactionSet>
```

FIG.8C

```
<segment code='ST'>                    650
   <name>Transaction Set Header</name>
                                651
   <element code='143'>
                                652
      <name>ID Code</name>
      <value code='850'>X12Purchase Order</value>
   </element>
   </element code='329'>
      <name>Control Number</name>
      <value>100</value>
   </element>                   899
</segment>
```

800

FIG.9A


<loop code='N1'>

<name>Name</name>
<element code='98'>
<name>Entity ID</name>
<value code='BY'>Buying Party</value>
</element>
<element code='93'>
<name>Name</name>
<value>AT&T</value>
</element>

<name>Geographic Location</name>
<element code='156'>
<name>State</name>
<value>NJ</value>
</element>

</loop>
912
910
802
<loop code='N1'>

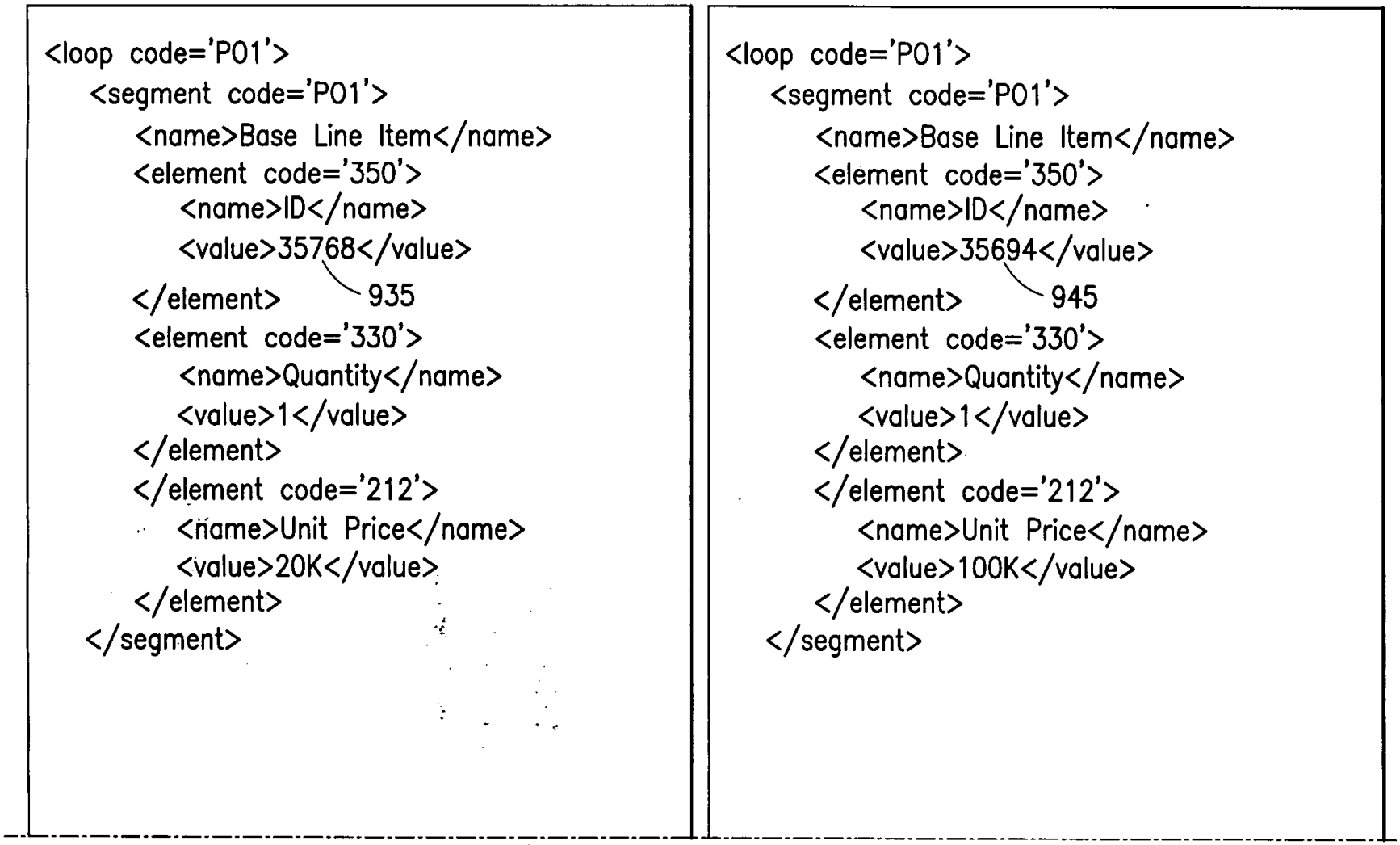
<name>Name</name>
<element code='98'>
<name>Entity ID</name>
<value code='SE'>Selling Party</value>
</element>
<element code='93'>
<name>Name</name>
<value>IBM</value>
</element>

<name>Geographic Location</name>
<element code='156'>
<name>State</name>
<value>NY</value>
</element>

</loop>
922
920
804

FIG.9B

FIG.9C-1

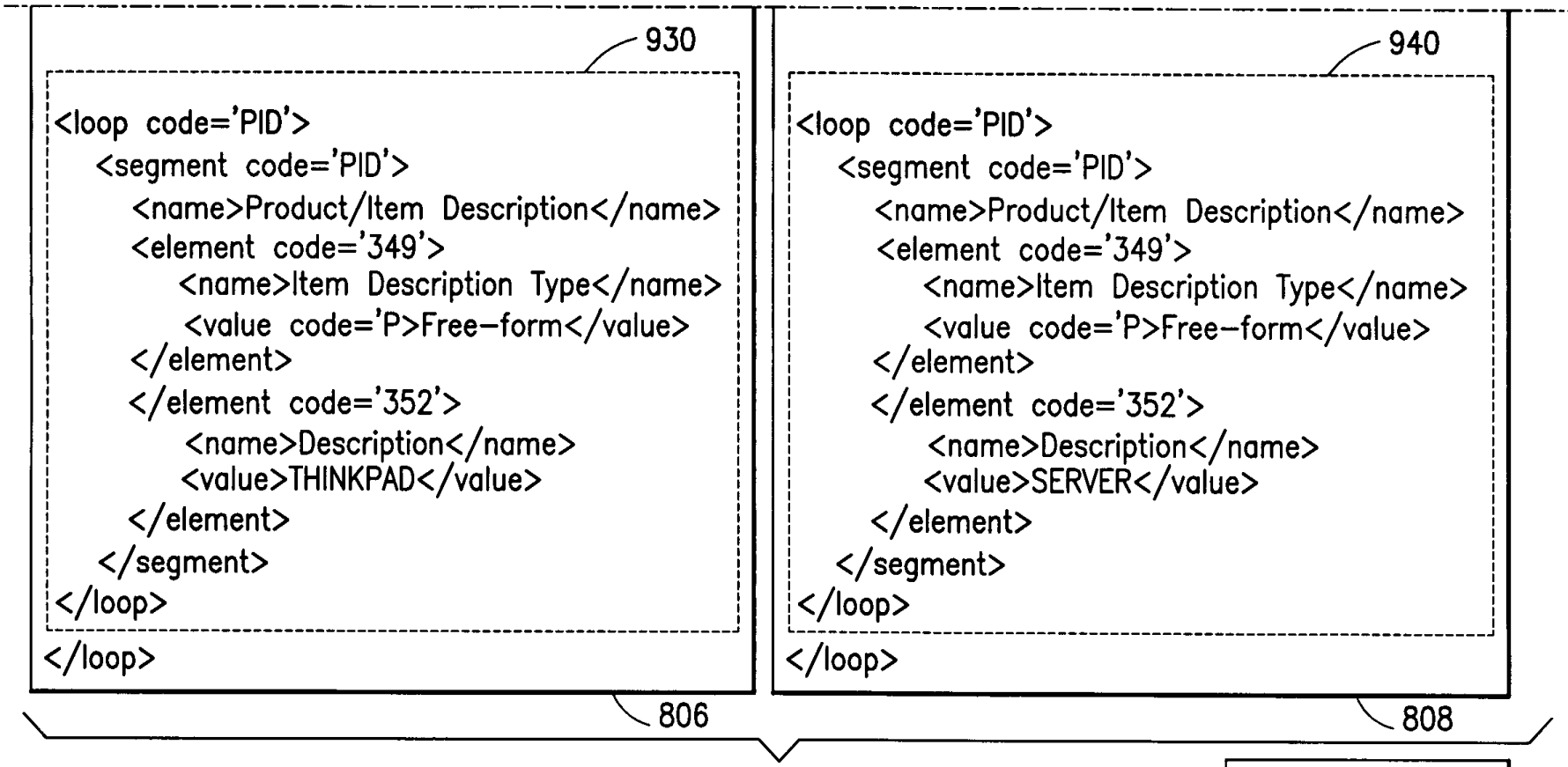

<loop code='P01'>

<name>Base Line Item</name>
<element code='350'>
<name>ID</name>
<value>35768</value>
</element>
<element code='330'>
<name>Quantity</name>
<value>1</value>
</element>
</element code='212'>
<name>Unit Price</name>
<value>20K</value>
</element>

935
<loop code='P01'>

<name>Base Line Item</name>
<element code='350'>
<name>ID</name>
<value>35694</value>
</element>
<element code='330'>
<name>Quantity</name>
<value>1</value>
</element>
</element code='212'>
<name>Unit Price</name>
<value>100K</value>
</element>

945


930
<loop code='PID'>

<name>Product/Item Description</name>
<element code='349'>
<name>Item Description Type</name>
<value code='P>Free-form</value>
</element>
</element code='352'>
<name>Description</name>
<value>THINKPAD</value>
</element>

</loop>
</loop>
806
940
<loop code='PID'>

<name>Product/Item Description</name>
<element code='349'>
<name>Item Description Type</name>
<value code='P>Free-form</value>
</element>
</element code='352'>
<name>Description</name>
<value>SERVER</value>
</element>

</loop>
</loop>
808

FIG.9C-2

FIG.9C

FIG.9C-1

FIG.9C-2

```
1020 <!DOCTYPE BUYERS [                    1000 1005
     <!ELEMENT BUYERS(buyer)* ::r:=row (buyers)>
                                                1030
1021 <!ELEMENTbuyer (ID, name, address, itemname, buyDate)>
                                                        1010
               1035
          :: x:=row(company, <coid>, <field(buyers, buyerid, r)>)
1022 <!ELEMENT ID(#PCDATA: field(buyers, buyerid, r))>
                                                1006
                                          1007
1023 <!ELEMENT name(#PCDATA: field(company, name, x))>
                                              1011
1024 <!ELEMENT address(#PCDATA: field(company, addr, x))>
                                                1012
1025 <!ELEMENT itemname(#PCDATA: field(buyers, itemname, r))>
                                                1008
1026 <!ELEMENT buyDate(#PCDATA: field(buyers, buyday, r))>
                          1040                  1009
     ]>
```

FIG. 10A

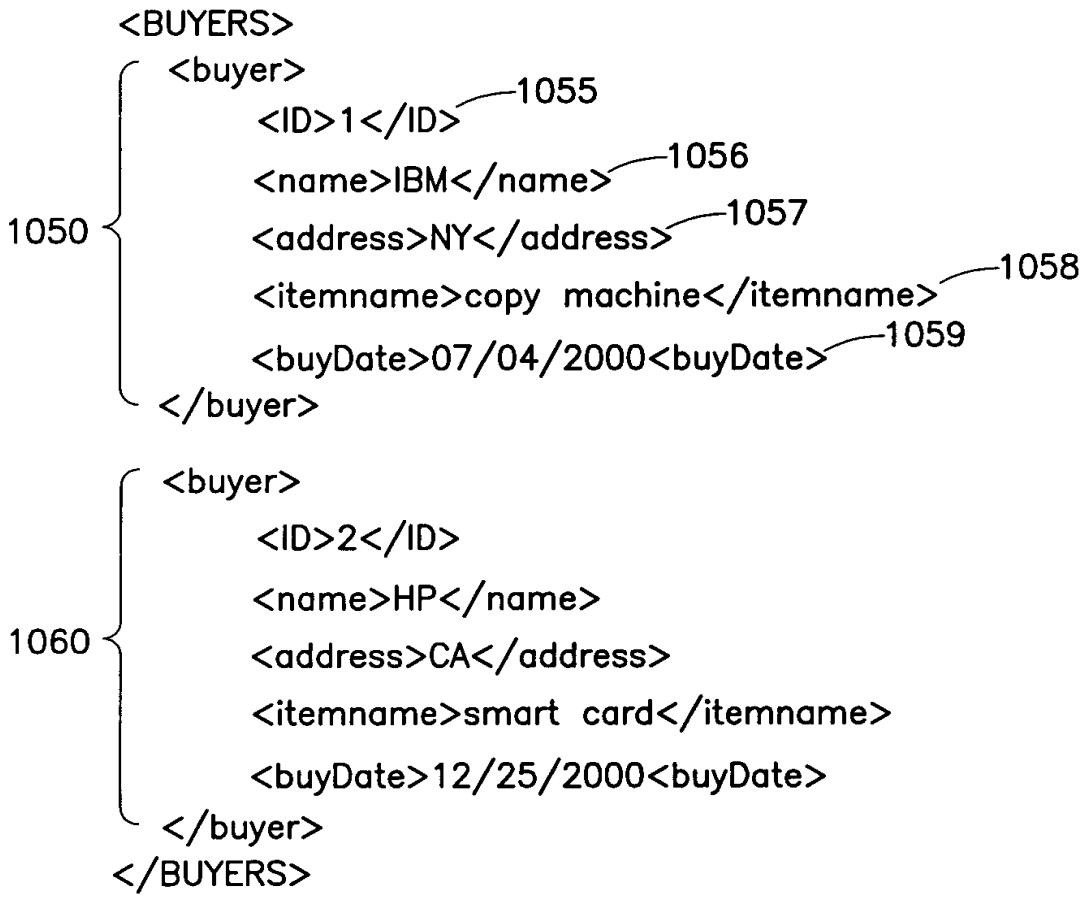

<BUYERS>
<buyer>
<ID>1</ID>
<name>IBM</name>
<address>NY</address>
<itemname>copy machine</itemname>
<buyDate>07/04/2000<buyDate>
</buyer>
<buyer>
<ID>2</ID>
<name>HP</name>
<address>CA</address>
<itemname>smart card</itemname>
<buyDate>12/25/2000<buyDate>
</buyer>
</BUYERS>
1055
1056
1057
1058
1059
1050
1060

FIG.10B

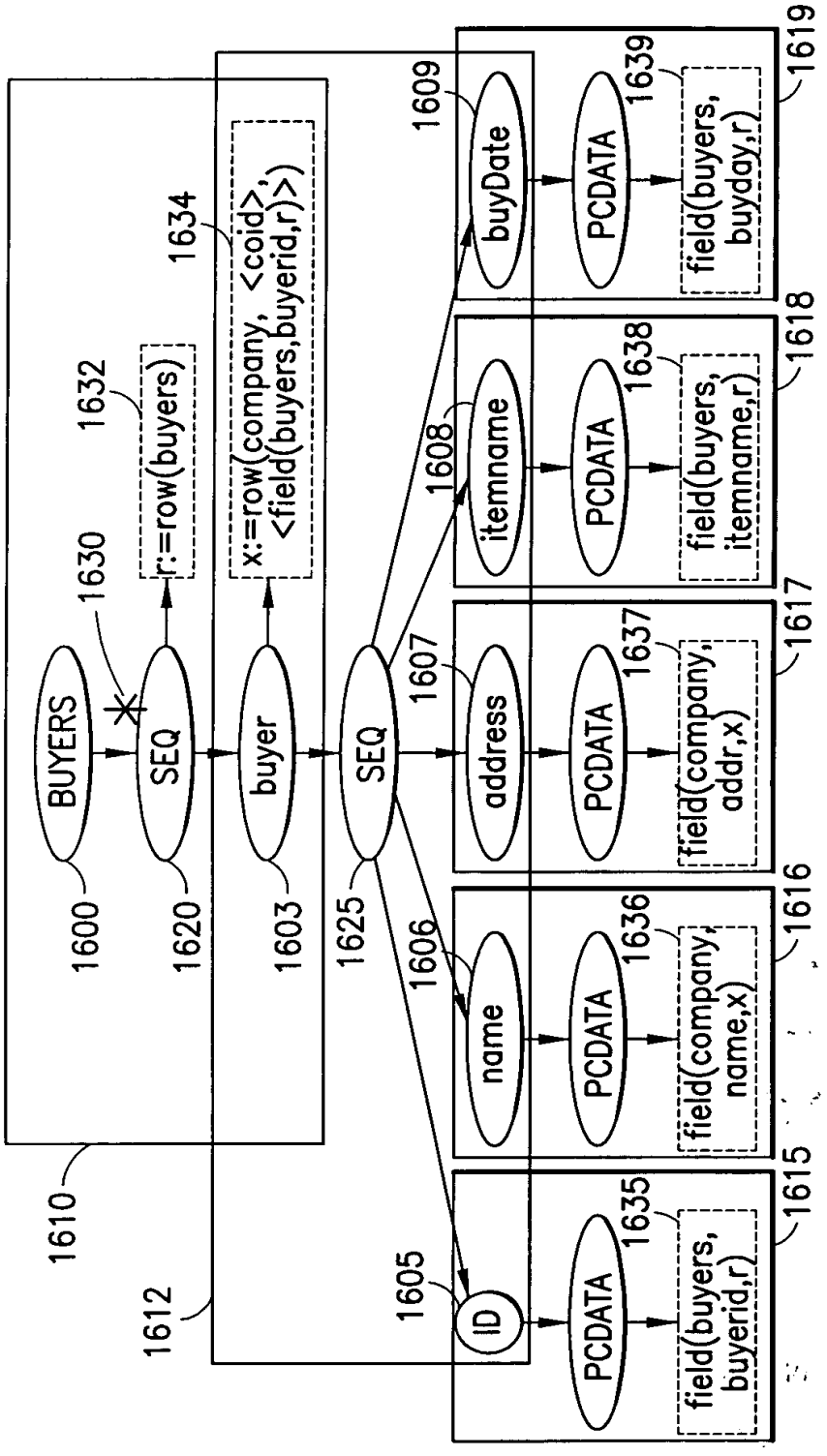

BUYERS
SEQ
buyer
SEQ
ID
name
address
itemname
buyDate
PCDATA
field(buyers, buyerid,r)
field(company, name,x)
field(company, addr,x)
field(buyers, itemname,r)
field(buyers, buyday,r)
r:=row(buyers)
x:=row(company, <coid>, <field(buyers,buyerid,r)>)
1600
1603
1605
1606
1607
1608
1609
1610
1612
1615
1616
1617
1618
1619
1620
1625
1630
1632
1634
1635
1636
1637
1638
1639

FIG.11A

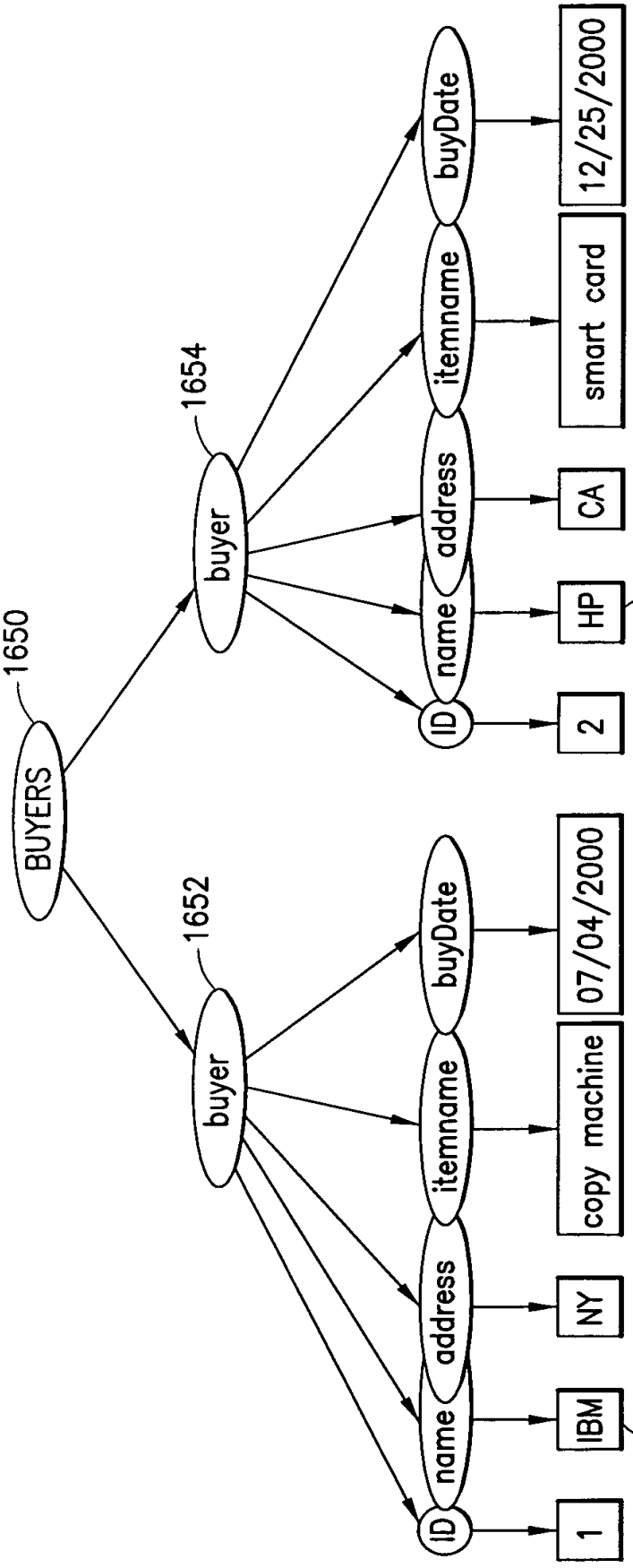

BUYERS
1650
buyer
1652
buyer
1654
ID
name
address
itemname
buyDate
1
IBM
NY
copy machine
07/04/2000
2
HP
CA
smart card
12/25/2000
1656
1658

FIG.11B

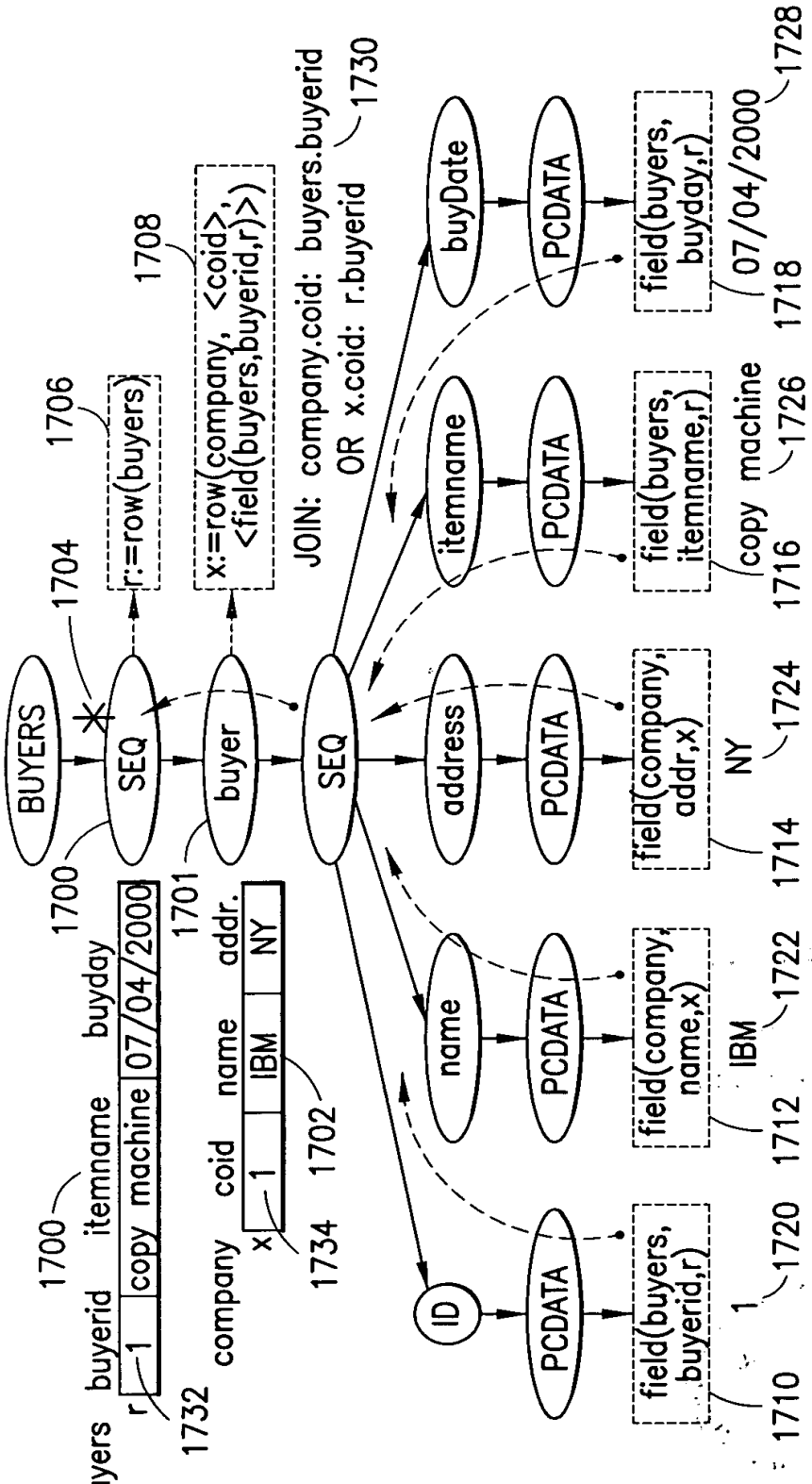

BUYERS
SEQ
buyer
SEQ
r:=row(buyers)
x:=row(company, <coid>, <field(buyers,buyerid,r)>)
JOIN: company.coid: buyers.buyerid
OR x.coid: r.buyerid
1700
1704
1706
1708
1730
1701
buyers
buyerid
itemname
buyday
r
1
copy machine
07/04/2000
1732
company
coid
name
addr.
x
1
IBM
NY
1734
1702
ID
PCDATA
field(buyers, buyerid,r)
1
1720
1710
name
PCDATA
field(company, name,x)
IBM
1722
1712
address
PCDATA
field(company, addr,x)
NY
1724
1714
itemname
PCDATA
field(buyers, itemname,r)
copy machine
1726
1716
buyDate
PCDATA
field(buyers, buyday,r)
07/04/2000
1728
1718

FIG.12A

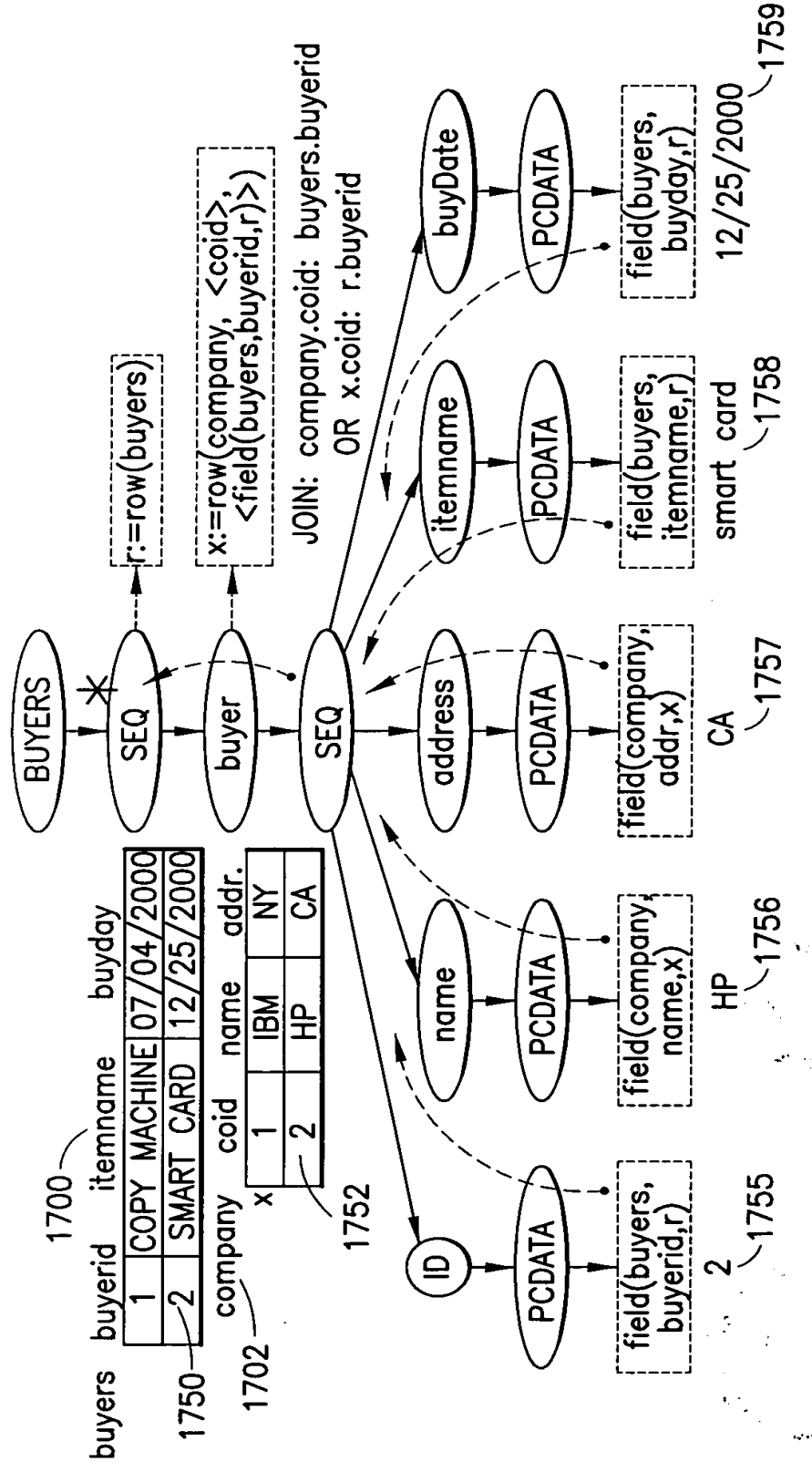

1700
buyers
buyerid itemname buyday
1 COPY MACHINE 07/04/2000
2 SMART CARD 12/25/2000
1750
company
coid name addr.
1 IBM NY
2 HP CA
1702
x
1752
BUYERS
SEQ
r:=row(buyers)
buyer
x:=row(company, <coid>, <field(buyers,buyerid,r)>)
SEQ
JOIN: company.coid: buyers.buyerid
OR x.coid: r.buyerid
ID
PCDATA
field(buyers, buyerid,r)
2
1755
name
PCDATA
field(company, name,x)
HP
1756
address
PCDATA
field(company, addr,x)
CA
1757
itemname
PCDATA
field(buyers, itemname,r)
smart card
1758
buyDate
PCDATA
field(buyers, buyday,r)
12/25/2000
1759

FIG.12B

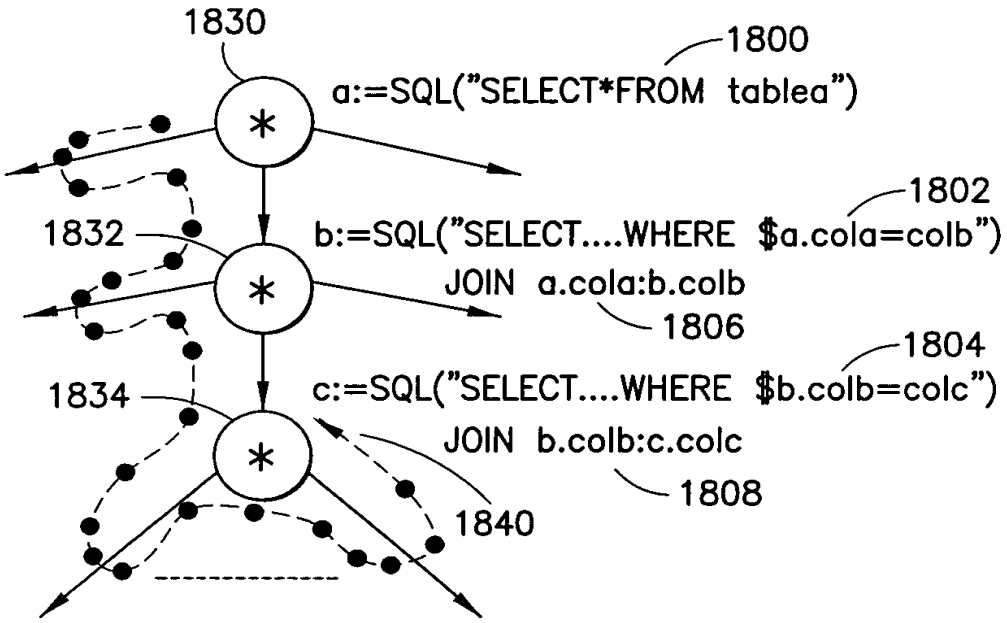

1830
1800
a:=SQL("SELECT*FROM tablea")
1802
1832
b:=SQL("SELECT....WHERE $a.cola=colb")
JOIN a.cola:b.colb
1806
1804
1834
c:=SQL("SELECT....WHERE $b.colb=colc")
JOIN b.colb:c.colc
1808
1840

FIG.13

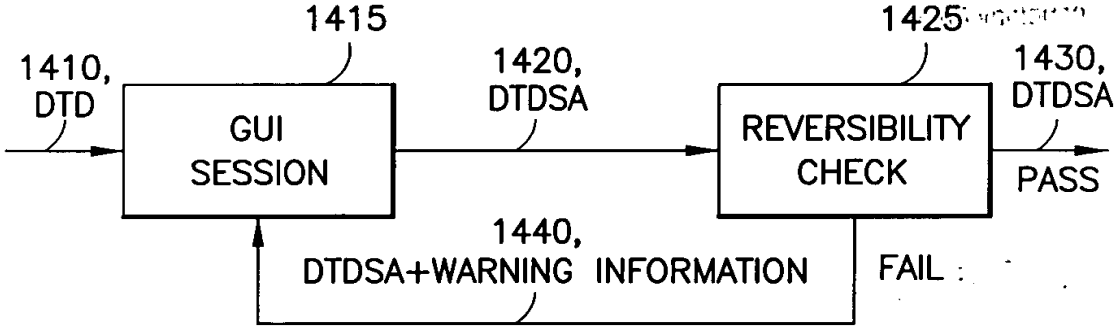

1415
1425
1410,
DTD
1420,
DTDSA
1430,
DTDSA
GUI
SESSION
REVERSIBILITY
CHECK
PASS
1440,
DTDSA+WARNING INFORMATION
FAIL

FIG.14